

Problem 1

Problem 2

Part A

By the definition of a conditional distribution,

$$p_{X|Y}(x|3) = \frac{p(x, 3)}{p_Y(3)} = \frac{p(x, 3)}{0.05 + 0.1 + 0.35} = 2p(x, 3).$$

Therefore

$$\begin{aligned} p_{X|Y}(1 | 3) &= \frac{1}{10} \\ p_{X|Y}(2 | 3) &= \frac{2}{10} \\ p_{X|Y}(3 | 3) &= \frac{7}{10} \end{aligned}$$

Part B

Again by the definition of a conditional distribution,

$$p_{Y|X}(y|2) = \frac{p(2, y)}{p_X(2)} = \frac{p(2, y)}{0.2 + 0.1 + 0.05} = \frac{20p(2, y)}{7}.$$

Therefore

$$\begin{aligned} p_{Y|X}(1 | 2) &= \frac{2}{10} \cdot \frac{20}{7} = \frac{4}{7} \\ p_{Y|X}(2 | 2) &= \frac{1}{10} \cdot \frac{20}{7} = \frac{2}{7} \\ p_{Y|X}(3 | 2) &= \frac{1}{20} \cdot \frac{20}{7} = \frac{1}{7} \end{aligned}$$

Part C

No they are not the same. We have

$$p_{Y|X}(3 | 2) = \frac{1}{7} \neq \frac{2}{10} = p_{X|Y}(2 | 3).$$

Problem 3

Problem 4